region6news

Friday, September 01, 2017

Arkansas, Louisiana, New Mexico, Oklahoma, Texas, and 66 Tribal Nations

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Hurricane coverage:

1 — New explosions expected at Crosby chemical plant, Houston Chronicle, 9/1/2017
http://www.houstonchronicle.com/news/houston-texas/texas/article/New-explosions-expected-at-Crosby-chemical-plant-12163386.php
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3 — Harvey Has Morphed into a Multi-Pronged Environmental Disaster, New Republic, 8/31/2017
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Air pollution, chemical and gas spills, dirty floodwater: Harvey is posing a unique threat to public health and an incredible challenge for the regional EPA.

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The U.S. Environmental Protection Agency said on Thursday that floodwaters from Tropical Storm Harvey could contain bacteria and other disease agents as sewers overflow.

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http://wapo.st/2vxw4nm
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14 — Twelve steps Houston can take to address our flooding problem, Houston Chronicle, 8/31/2017
http://www.houstonchronicle.com/local/gray-matters/article/Twelve-steps-Houston-can-take-to-address-our-12164836.php
The Houston region has a major flooding problem. Denying this fact does a disservice to us all, because flooding will only get worse in the future as the intensity and frequency of severe rain events increases.

Other news:

15 — Grand Resilience: How a State Agency Pioneered Gas Technology and Bolstered Critical Supply, Power Magazine, 9/1/2017

http://www.powermag.com/grand-resilience-how-a-state-agency-pioneered-gas-technology-and-bolstered-critical-supply/?printmode=1
The Grand River Dam Authority (GRDA), a non-appropriated agency founded by the Oklahoma Legislature in 1935, has sought in recent years to diversify its power generating portfolio to ensure it can continue to reliably supply power to some portion of 75 of the state's 77 counties—including its direct customers, which include municipalities, a host of electric cooperatives, and 80 industrial and commercial customers

16 — EDITORIAL: 3 votes should be charm on fluoridating our water, Albuquerque Journal, 8/31/2017
https://www.abqjournal.com/1054929/3-votes-should-be-charm-on-fluoridating-our-water.html
The science is irrefutable and public sentiment has been heard ad nauseam for the past two years, but last week the seven-member Albuquerque Bernalillo County Water Utility Authority board still couldn't bring itself to resume adding fluoride to the county's domestic water system.

17 — Rain soaks state's east; 1 Arkansas city gets 10+ inches, floods, Arkansas Democrat-Gazette, 9/1/2017
http://www.arkansasonline.com/news/2017/sep/01/rain-soaks-state-s-east-areas-flood-in-/
More than 10 inches of rain fell Thursday on McCrory as the remnants of Hurricane Harvey blustered through eastern Arkansas, flooding streets and forcing many people to sandbag homes and businesses to combat rising waters.

18 — Low pressure system could form in Gulf by weekend, National Hurricane Center says, Baton Rouge Advocate, 8/31/2017
http://www.theadvocate.com/baton_rouge/news/weather_traffic/article_03f89650-8db0-11e7-b15d-6f044adff3fb.html
An area of low pressure could form over the southwestern Gulf of Mexico by the weekend, the National Hurricane Center said.

19 — Sienna Plantation residents hope the levee holds, Fort Worth Star-Telegram, 8/31/2017
http://www.star-telegram.com/news/article170685267.html
video

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TEXAS

New explosions expected at Crosby chemical plant

By Matt Dempsey, Keri Blakinger, and Lindsay Ellis | August 31, 2017 | Updated: August 31, 2017 9:18pm

3

Photo: Godofredo A. Vasquez, Houston Chronicle

IMAGE 1 OF 80

The Arkema chemical plant is flooded from Tropical Storm Harvey Wednesday, Aug. 30, 2017, in Crosby, Texas. Floodwaters from Harvey have knocked out power and generators that keep volatile organic peroxides

... more

The first of nine failing freezer trailers filled with volatile chemicals exploded early Thursday at the problem-plagued Arkema plant in Crosby, sending a plume of black smoke into the community east of Houston and setting off a round-the-clock watch for inevitable explosions to come.

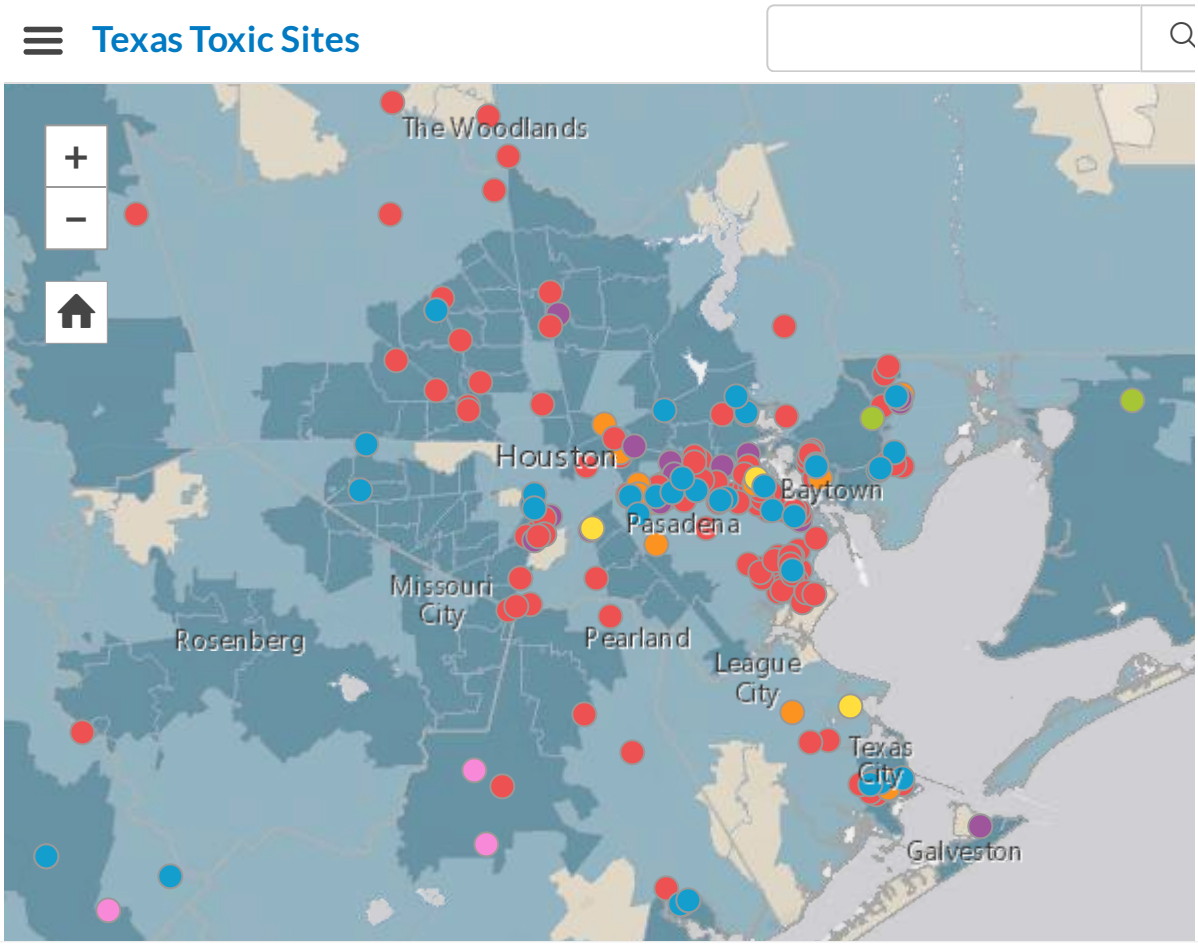
The initial blast about 1 a.m. Thursday sent 15 Harris County sheriff's deputies to the hospital after they inhaled fumes and got smoke in their eyes, but all were discharged by Thursday afternoon.

Crosby officials had been bracing for days for explosions at the plant after six feet of floodwaters from Hurricane Harvey knocked out power and generators needed to keep the volatile organic peroxides — used in making plastics and rubber — stored at the facility cool. The chemicals explode if they get too warm, officials said.

The explosion left unanswered questions about how contingency plans failed to keep the chemicals cool and how dangerous the fallout could be to a sprawling metropolitan area recovering from the biggest rain event in continental U.S. history.

Federal Emergency Management Agency Administrator Brock Long on Thursday called the plume "incredibly dangerous."

The map below highlights locations of toxic sites and facilities in Texas. Darker color shades of blue indicate areas of higher diversity. See menu button for complete map legend.



Arkema President Richard Rennard said the health effects are relative.

"They're noxious, certainly," Rennard said. "If you breathe in the smoke, it's going to irritate your lungs."

Arkema CEO Rich Rowe said earlier in the week that the explosions could not be stopped.

"There is no way to prevent an explosion or fire," Rowe said.

THE LATEST: Get rolling updates, newest photos on Harvey here

The company has a history of regulatory problems.

In 2006, the Texas Commission on Environmental Quality cited Arkema for a fire caused by improperly stored organic peroxides. In 2011, the same plant was cited for failing to maintain

proper temperatures of its thermal oxidizer.

In 2016, the Occupational Safety and Health Administration fined Arkema $91,724 after finding 10 violations at the Crosby site, many involving the mishandling of hazardous materials.

Arkema's CEO Richard Rowe said earlier this week that the company spent millions of dollars on upgrades after the fines and believed all issues cited in the inspections had been addressed.

The Houston area is home to more than 2,500 chemical plants. An investigation by the Houston Chronicle in 2016 found 55 facilities — including Arkema — with a high potential for harm to the public, based on an analysis performed in conjunction with the Mary Kay O'Connor Process Safety Center at Texas A&M University. The study factored risks based on the amount and type of dangerous chemicals on site and their proximity to the public.

At least 13 of the facilities with the highest potential for harm lie within the 100-year flood plain. The Arkema plant lies within the 500-year flood plain, according to a Chronicle analysis.

Fire Burns at Houston Chemical Plant

A Houston-area chemical plant that lost pow ey engulfed the area in extensi…

A Houston-area chemical plant that lost power after Harvey engulfed the area in extensive floods was rocked by two explosions early Thursday, the plant's operator said. (Aug. 31)

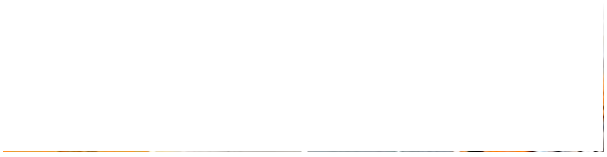
Media: JW Player

Arkema officials wouldn't say the company had the ability to neutralize the chemicals before the situation became so volatile, and wouldn't answer questions about whether the back-up generators were elevated before the storm hit the area late Saturday.

Rennard said that other highly toxic chemicals on the site were in a "remote location," far from the exploding organic peroxides. Officials had not provided a requested map of the facility by late Thursday.

READ ALSO: Politico blasted for cartoon that critics say mocks Harvey victims

The Arkema plant lost power late Monday, knocking out the primary supply and back-up generators and forcing employees to move the organic peroxides into 18-wheeler box vans with cooling systems.



One employee was evacuated Monday night. Eleven other employees were evacuated Tuesday when the refrigeration in the back-up containers also began to fail.

Local officials ordered the evacuation of residents after seeing the chemical inventories for the facility, which the company has not publicly released. Company officials said they expected the refrigeration to fail in all the trailers and that additional explosions were inevitable.

The incident came as chemical facilities throughout the Houston area began drying out and restarting facilities that had been shut down as Hurricane Harvey approached last week.

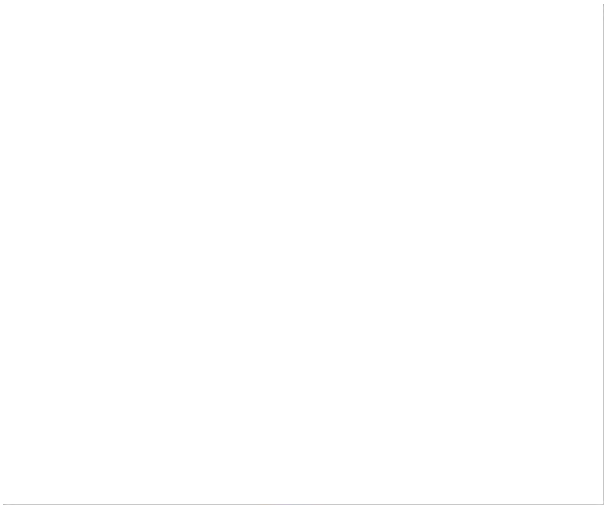
The U.S. Chemical Safety and Hazard Investigation Board issued a safety alert Thursday urging the facilities to take special precautions as they resumed operations.

"Restarting a refinery poses a significant safety risk," CSB Chairperson Vanessa Allen Sutherland said in a statement. "When operators follow established startup procedures and checklists, it reduces the risk to a catastrophic accident that could cost lives and incur substantial product disruptions."

The environmental damage from those startups can be enormous.

About 2 million pounds of emissions have been released during Harvey-related shutdowns and incidents, compared to more than 5.2 million pounds all of last year. Emissions from Aug. 23 through Monday in the Houston area represented nearly 40 percent of the region's releases for all of 2016, based on pounds of chemicals, according to Luke Metzger, director of the advocacy group Environment Texas.

Gov. Greg Abbott ordered a relaxing of state environmental reporting laws during Hurricane Harvey, and companies are still reporting leaks and other incidents voluntarily, according to TCEQ spokesperson Andrea Morrow.



Among those voluntary reports was a roof collapse at an ExxonMobil facility in Baytown that caused the release of more than 12,000 pounds of material.

'NO WAY TO PREVENT': Read Wednesday's update on the chemical plant's risk

In Crosby, neighbors in and around the evacuation zone remained worried Thursday, saying they had received little official information and a lack of a clear perimeter.

"But homes two miles away are safe?" asked Alicia Garcia, who had recently returned to the family's home about four miles away after evacuating Sunday because of flooding.

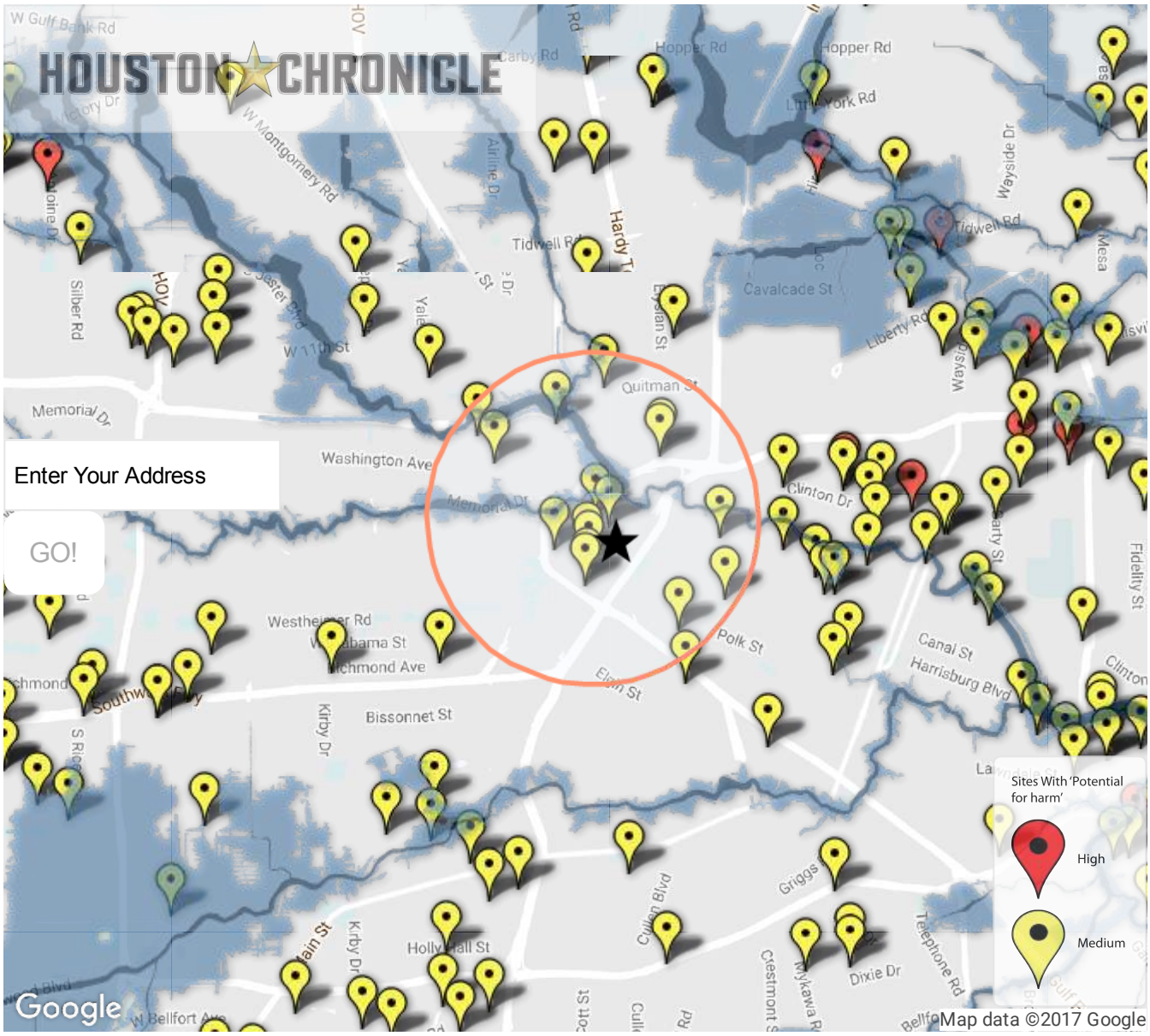
At least one couple didn't leave. Leo and Lajayne Opelia, who are in their 70s, texted friend Frances Breaux that they intended to stay.

"And if they didn't make it, they loved us," Breaux said.

Harvey aftermath: Chemical plants imperiled

Hurricane Harvey's winds and floodwaters have created emergencies at chemical facilities across the Houston area, from an Exxon Mobil roof collapse at its massive Baytown complex to the risk of an explosion at a chemical plant northeast of Houston. We combined our Chemical Breakdown risk map, based on a facility's potential for harm, with the region's 100-year floodplains. Type in a Harris County

address in the search bar above to view which sites with "potential for harm" fall within a two-mile radius of that address.



Map written and coded by John D. Harden, with Harvey-related map updates by Rachael Gleason | Source: Mary Kay O'Connor Process Safety Center at Texas A&M and Houston Chronicle

Deputies wouldn't allow Breaux into the neighborhood Thursday to check on the couple.

"You know how older people are," she said. "They just don't want to leave their place."

Derek Davis, 36, lives outside the evacuation zone but shared his neighbors' questions and concerns.

"What was the basis of the blast zone? How was that calculated? How was safety taken into consideration? Do they expect a mile-and-a-half radius? Are they taking a fudge factor into account? Did they consider the wind? What was the fail-safe program they had?" he asked. "It seems like they're trying to save the product and risk the residents."

'IT'S TERRIFYING': Family returns to flooded home, finds new danger nearby

CHEMICAL BREAKDOWN: *In November 2014, four workers died at a DuPont plant in La Porte after being exposed to a toxic gas. Responding emergency workers weren't sure what was in the air. The surrounding community wasn't, either. A Houston Chronicle investigation dives deep into Houston's hidden world of explosions and toxic releases and probes the regulatory failures that put us in jeopardy.* Click here to read our series.

EPA: Any toxic materials from Arkema plant fire not yet a concern

Reuters Staff

WASHINGTON (Reuters) - Concentrations of any toxic materials released in a chemical fire at Arkema SA's (AKE.PA) flooded plant 25 miles northeast of Houston appear too small for concern for now, the U.S. Environmental Protection Agency said in a statement on Thursday.

Information from an aircraft that surveyed the area in Crosby, Texas, earlier on Thursday "indicates that there are no concentrations of concern for toxic materials reported at this time," the EPA said.

Brendan Smialowski/Getty

Harvey Has Morphed into a Multi-Pronged Environmental Disaster

Air pollution, chemical and gas spills, dirty floodwater: Harvey is posing a unique threat to public health and an incredible challenge for the regional EPA.

BY **EMILY ATKIN**

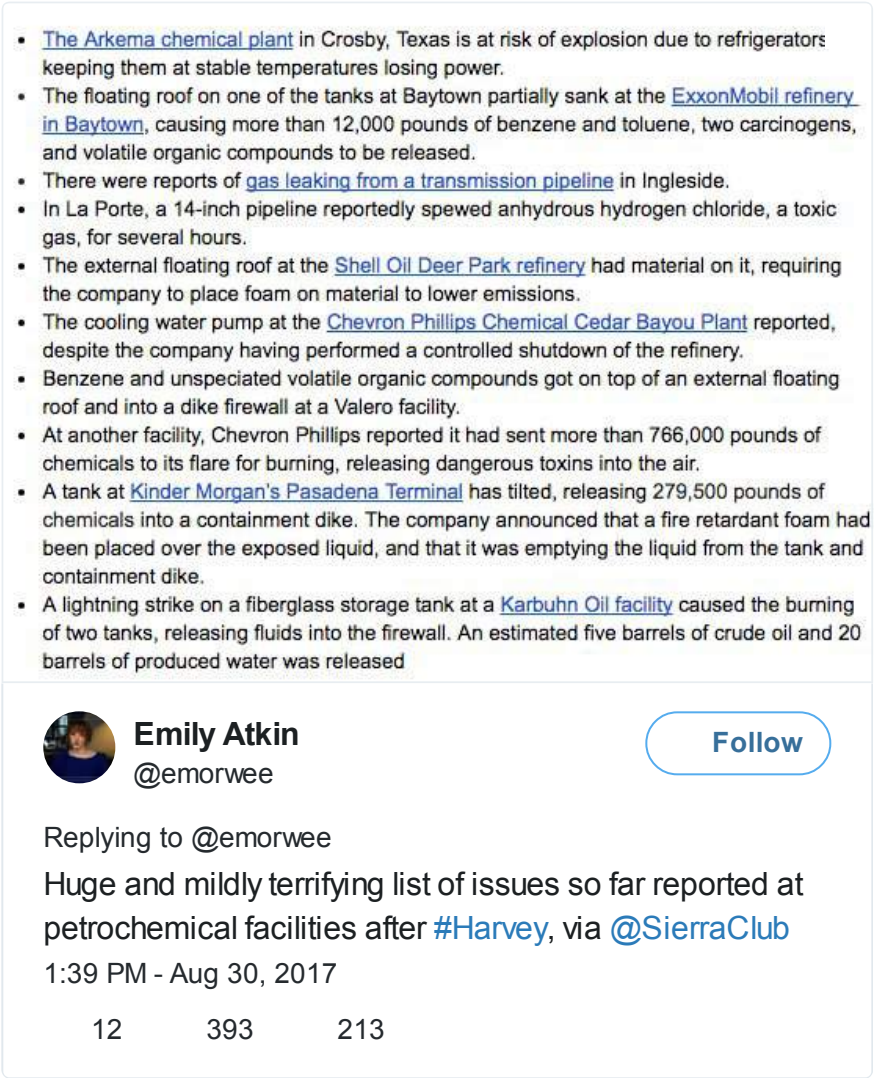
August 31, 2017

At first, it was just another thing to worry about. Hurricane Harvey was headed straight toward the heart of America's petrochemical industry, where dozens of refineries and chemical plants sit next to vulnerable communities. There were forecasts of biblical rainfall, which experts predicted could flood facilities and cause accidental toxic substance releases, or worse, explosions. If multiple plants shut down at once, there could be huge emissions of harmful air pollutants. And if too much rain fell on the region's Superfund sites, they could overflow, threatening human health.

It's been nearly a week since Harvey first made landfall in Texas, and all of these things have happened. In the most high-profile case, a flooded chemical plant east of Houston burst into blast smoke twice, leaking chemicals and sending 15 people to the hospital. Federal Emergency Management Agency administrator Brock Long is calling the plume "incredibly dangerous," noting that the organic peroxides at the facility pose threats to human health. Residents living in a 1.5-mile radius around the plant were ordered to evacuate.

But this is far from the only pollution event that has resulted from Harvey, and arguably not the most dangerous. More than one million pounds of toxic air pollutants have spewed into the region's atmosphere due to mass refinery and chemical plant shutdowns, with more pollution events expected as the plants start to back up. Drinking water across southeast Texas is also "going to be contaminated," infectious disease specialist Rick Watkins told the *Guardian*, because of the disruption of sewage systems, which will leak into floodwater. According to *Newsweek*, "drinking water has [already] come into contact with dirty floodwater." Superfund sites, of which there are at least a dozen in Harris County, continue to threaten contamination of floodwater as well.

Other spills are happening too. Rainfall caused a 6.3-million-gallon gas tank to tip over and leak "an unspecified amount" of fuel at a Kinder Morgan facility in Pasadena. On Wednesday, the Sierra Club released a long list of issues reported at petrochemical facilities across the region. More are likely on the way.



These combined threats pose a truly unprecedented challenge for the regional office of the Environmental Protection Agency that covers southeast Texas. "I can tell you, there was nothing

even remotely like this during Sandy," said Judith Enck, the former EPA Region 2 administrator who handled the environmental response to that historic 2012 storm. "We had some refineries in New Jersey that were impacted, but nothing like this."

Fortunately, the regional EPA office covering Houston and the surrounding areas appears to recognize the magnitude of the challenge. On Wednesday, EPA's Region 6 office activated the National Incident Management Team, said David Gray, the office's acting deputy regional administrator. That team consists of on-scene disaster response coordinators from other regional EPA offices across the country to handle the multiple threats. And though President Donald Trump has not appointed a Region 6 administrator, the acting administrator, Sam Coleman, was in charge of EPA's response to Hurricane Katrina. "Our team here in Region 6 has a lot of experience over the years in responding to emergencies," Gray said in an email.

Specifically, Gray said EPA officials have inspected two Superfund sites near Corpus Christi and have visited two wastewater and drinking water systems that may be contaminated. (Gray did not specify which ones.) He said aerial assessment aircrafts are conducting reconnaissance over the impacted area. And he said the regional office is coordinating with FEMA and EPA's D.C. headquarters. "Administrator [Scott] Pruitt is in regular contact with EPA staff across the agency who are part of this hurricane response effort," Gray said.

It is far too early to assess the effectiveness of the EPA's response—and too early to say what the human health effects will be. While the Arkema chemical plant situation was drawing significant attention from the media on Thursday, it is not the biggest threat to public health, according to Dan Cohan, an environmental engineering professor at Rice University who specializes in air quality management. That honor will likely go either to contaminated drinking water or to the air pollution coming from the many petrochemical facility shutdowns and startups.

"I think the shutdowns and startups and other exceptional event releases are likely more important (though less dramatic and visible)," Cohan said. "They're likely to release far more pollution overall, and the startups coming during weather when the pollution could more easily impact air quality." Mass shutdowns of petrochemical facilities have already released thousands of pounds of carcinogenic compounds into the atmosphere, but the wind and rain from the hurricane likely dissipated the emissions. Now, as the rain and winds clear, multiple petrochemical facilities will be starting up at the same time. Startups are huge emissions events, and many will likely be happening in unison.

The vast majority of these plants are located in the Houston area, posing a health risk to the millions of people who live there. Most at risk, however, are the communities that live directly next to the facilities—communities that are disproportionately low-income and minority. In a statement issued via the Sierra Club, local Houston environmental justice organizer Bryan Parras said the risk these communities face is "terrifying," particularly because the state's air quality monitors are down. "The only way we can really know what's happening is when we see it or smell it," he said.

The uncertainty that comes with this multi-pronged pollution risk will be a new feeling for many in Houston and the surrounding area, but not for Parras or the people who live in the city's East End. "The environmental crimes against my community and thousands more like it have been happening for decades, and superstorms like Harvey only heighten the threats we face," he said. Perhaps now that the threat has ballooned into a region-wide crisis, those in charge of preventing these disasters will start to pay attention.

Emily Atkin is a staff writer at the *New Republic*. @emorwee

BEAUMONT ENTERPRISE http://www.beaumontenterprise.com/news/article/Beaumont-could-be-without-water-for-days-12163451.php

Update: Some taps are on in Beaumont

The Enterprise **Updated 8:45 am, Friday, September 1, 2017**

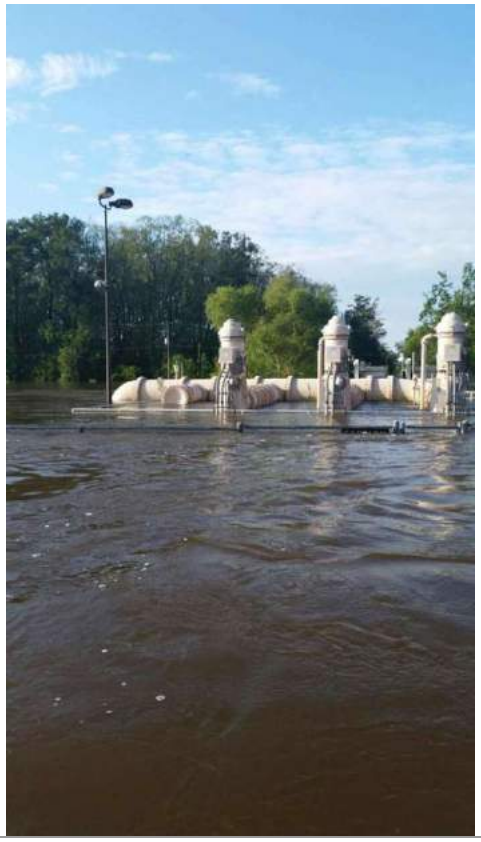


IMAGE 1 OF 13

The city's main intake water pump station on Thursday. Seventy percent of the City of Beaumont's water comes from this facility on the Neches River. Photo: City of Beaumont

UPDATE: 8:44 a.m.

Some Beaumont residents are sharing on social media that their taps are back on and that water is coming out in a slow trickle.

The City of Beaumont said in a statement this morning that crews and private industries have been working around the clock to restore water service. Customers with water are reminded to refer to the boil water notice, the statement said.

THURSDAY

Beaumont is without a water supply after floodwaters knocked out the city's main pump station near the Neches River before 12:30 a.m. Thursday. The city of 120,000 also lost its secondary water source in Hardin County.

"We are doing everything we can to restore water to citizens and businesses," City Manager Kyle Hayes said Thursday during a news conference.

The Neches River is expected to crest on Saturday, Hayes said. Repair crews will get to both pump stations as soon as it is safe to do so, he said.

The plant north of the city in Hardin County was built in the 1960s and provides 30 percent of Beaumont's water. The plant just south of Collier's Ferry Park on Pine supplies 70 percent of the water.

READ MORE: **List: Where to go to get water in Beaumont**

Both are covered in floodwater, according to Hayes.

The city plans to set up water stations like it did after Hurricane Rita in 2005, he said. So far, the city has been able to get one truckload of water in because roads outside Beaumont are still flooded.

"Beaumont is basically an island," said Mayor Becky Ames.

Hayes said the city will announce water distribution locations as soon as it can.

Fire Chief Anne Huff encouraged residents to be proactive in preventing fires, but stressed her department can handle a fire if one breaks out in the city.

"We do not have tank trucks, but every city fire truck can hold between 500,000 and 750,000 gallons of water," she said. "We've made arrangements with neighboring rural towns to use their tanker trucks."

RELATED: **Christus St. Elizabeth open, using wells**

Huff said the city sends five trucks to every fire.

"Don worry, but be as safe as you can," she said. "Don't use candles and be careful when cooking. Don't leave pots on burners."

City Councilman Mike Getz estimated in a Facebook post Thursday morning that restoration could take until Monday or Tuesday.

Hayes said he couldn't offer a timeline, stressing his work crews won't be able to assess damages until the water starts to recede.

Hayes was asked if FEMA would be helping with water.

He replied that the situation is "difficult because of Houston and Louisiana."

EPA says Harvey's floodwaters may contain disease hazards including bacteria

Reuters Staff

WASHINGTON, Aug 31 (Reuters) - The U.S. Environmental Protection Agency said on Thursday that floodwaters from Tropical Storm Harvey could contain bacteria and other disease agents as sewers overflow.

In a joint statement with the Texas Commission on Environmental Quality, the EPA said precautions should be taken by anyone involved in cleanups including boiling water when advised to by local and state authorities. The biggest threat to public health now that the rain has ebbed is ensuring that people have access to safe drinking water and that waste water systems are being monitored, the EPA said. (Reporting by Timothy Gardner; Editing by Mary Milliken)

Brazos River continues to rise with major flooding expected Friday

By Emily Foxhall, Jacob Carpenter, and Robert Downen Updated 12:52 pm, Thursday, August 31, 2017

6

Photo: Brett Coomer, Houston Chronicle

IMAGE 1 OF 64

Clark Runge left, and David Garcia, stand on the banks of the Brazos River, as the water rises from heavy rains from Tropical Storm Harvey, on Monday, Aug. 28, 2017, in Richmond, Texas.

Brazoria County officials are warning that roughly 200 square miles of the county will be inundated with water from the Brazos River, which is projected to continue rising through Friday.

The previous top crest in Richmond -- at 54.7 feet -- was set during the Memorial Day floods of 2016. As of 6:15 a.m. Thursday, the Brazos in that city had hit a stunning new record: 54.9 feet.

All that water would be flowing south to Brazoria.

Local leaders in Brazoria disseminated an "inundation map" that shows enormous swaths of the county are expected to be under a significant amount of water. The exact measurements will vary by area. County officials have not defined the threshold for "inundation."

Projected inundated areas include Columbia Lakes, Rosharon, Holiday Lakes, Bar X, Bailey's Prairie, much of Jones Creek, and parts of the city of Brazoria east of Highway 36. Nearly all of

00:07 00:47

Aerial footage shows flooding in Port Arthur, Kountze, Beaumont and Sabine Pass, Texas. (Aug. 31)
Media: Associated Press

downtown West Columbia is spared on the map.

The inundation map does not include flooding from the San Bernard River, located west of the Brazos River. Water gauges there stopped working after the river rose quickly, with projections showing it breaking a record height by several feet.

On the western end of Brazoria County, the city of Sweeny, home to about 3,700 residents, warned residents Thursday morning to leave immediately due to imminent flooding of the San Bernard River. The city's mayor, Dale Lemon, said emergency management team members planned to leave Sweeny on Friday.

"This is an event that will be a catastrophic event for our city and the surrounding areas," Lemon said.

Lake Jackson officials also issued a voluntary evacuation order Thursday morning for neighborhoods in the northwest section of the city. The order covers all areas west of Highway 288 and north of FM 2004. A small pocket of homes on the northeast side -- between FM 2004, Yaupon Street, Southern Oaks Drive and Old Angleton Road – also was issued the voluntary evacuation. City officials said flooding in low-lying areas could enter homes there.

The entire area included in the inundation map has been under a mandatory evacuation order since Sunday. Parts of the area on the inundation map are already several feet underwater.

The Brazos River in West Columbia sat at 30.2 feet Thursday morning, putting it in "minor" flood stage, as defined by federal officials. It's projected to crest at 32 feet -- the threshold for "major" flood stage -- by Friday evening, and stay at that height for several days

Fort Bend floods

Officials in Fort Bend on Thursday expected the mighty river would likewise swell still larger there as the day continued, predicting it would hit a top measurement of 56 feet on Friday, bringing unprecedented flooding to the county.

They remained on high alert Wednesday evening and into Thursday, with more and more flooding expected as the river crept up.

Fort Bend County Judge Bob Hebert in a press conference Wednesday evening renewed calls for people to limit travel through the county and cease sightseeing of flooded properties in boats.

"They could see the water in front of them," Hebert said of the couple that died, "but they chose to take the risk."

A total of 5,205 rescues had taken place so far across the county, as of the Wednesday evening news conference. Most rescues were not life threatening situations.

Mandatory evacuations for communities along the Brazos River, which snakes across the county, would not be lifted until the river began to go down and reached a point that access roads into communities would be clear of water, among other conditions, Hebert said.

Fort Bend County Judge Bob Hebert said in a video statement Thursday morning that the mandatory evacuation had come at the request of the sheriff's office.

"Certain individuals were abusing their privilege of re-entering, and placing themselves and others, including children, at risk," Hebert said. "We can't allow that."

Fort Bend County had received what Hebert called a "double punch" from the storm: record rainfall, followed by a river rising to record levels.

More than 170 square miles of the 860 square mile county were predicted to be under water when the river hit its peak.

Levees protecting numerous neighborhoods in the county nonetheless continued to be working, though rain water had built up in some, leading to the flooding of homes in a few cases. It took time for pumps to clear that water out.

The Washington Post

Post Nation

New dangers lurk in Harvey's wake

By Todd C. Frankel, Abigail Hauslohner and David A. Fahrenthold August 31 at 10:23 PM

PORT ARTHUR, Tex. — The water was leaving, at last. But, across Southeast Texas on Thursday, new dangers kept appearing in Hurricane Harvey's wake.

In Crosby, northeast of Houston, loud "pops" were heard coming from a crippled chemical plant, where safety systems were flooded and authorities said an explosion could be imminent.

In Beaumont, 118,000 people were without drinking water after floods disabled the city's system. For most of them, there was no easy way out of a town that now felt like more of an island: The city was surrounded by swollen rivers and bayous, cutting off most roads.

Forty miles to the southwest, in Anahuac, the employees of an alligator farm circled their flooded property in boats, with guns at the ready. There were 350 alligators inside, and their pens were flooding. "They were very close to getting out," a police officer said.

Above, Environmental Protection Agency planes sniffed for toxic-chemical releases. Below, there was floodwater that authorities warned could contain pollutants and pathogens. In between, there were authorities and people trying to find order and supplies in a landscape totally changed by the massive storm.

"We're running low on water and on food," said Lam Nguyen, a Port Arthur police sergeant who was overseeing a command center in a Walmart parking lot. He was wearing a red polo shirt instead of his usual police uniform, which was lost when his home flooded. "Our shelters are filling up. We are getting them food, for now, but we are running out of food. We're doing all we can now."

A Black Hawk helicopter landed nearby every 30 minutes, bringing in newly rescued people. Nguyen paused.

"We are in trouble," he said.

The remnants of Harvey were still moving to the northeast Thursday. Even in a weakened state, the storm still caused flash-flood watches in Tennessee, Kentucky and southern Ohio. Behind it, authorities continued to try to assess the damage left

behind by the largest rainstorm ever to hit the continental United States. On Thursday, an official with the Harris County Flood Control District gave an astounding estimate of the storm's impact on the Houston area: at the height of the flooding, 70 percent of the county's 1,800 square miles were covered with at least 1.5 feet of water. That is an area larger than Rhode Island.

At least 39 people were dead. They included Andrew Pasek, 25, who officials said was electrocuted when he stepped on a live electrical wire in the floodwaters, and Ronald Zaring, 82, an evacuee who became unresponsive while on a charter bus carrying him away from the flooding. Police in Houston began to make house-to-house searches, looking for more victims.

At least 34,000 people were scattered among dozens of shelters. Two huge convention centers. Mosques. Schools. At least 11 First Baptist Churches in 11 small Texas towns.

Authorities also were still tallying homes damaged or destroyed in the disaster. Texas localities had reported by Thursday that more than 93,000 homes suffered damage, including nearly 7,000 that were destroyed by Harvey, according to a Texas Department of Public Safety report. But that preliminary estimate does not include figures from heavily populated Houston and other cities that were hit hard by flooding, such as Port Arthur and Beaumont. The real number is likely to be far higher once authorities are able to assess areas that are currently unreachable.

On Thursday, thousands of people — the luckier ones — went back to homes that were waterlogged but salvageable.

"We raised up everything," said Susan Rath, who had returned to a home in south Houston where she and her husband, Jim, had tried to place valuables higher before evacuating. The water got higher still. They returned to soggy drywall, destroyed furniture and a closet full of blouses soaked up to the elbow. "It didn't matter."

The Raths had just rebuilt this house, after it was destroyed in a 2015 flood. Now, they will have to decide whether to rebuild again.

"The main thing is: This is just stuff," Jim Rath said. "And the more stuff you have, the more you're controlled by it."

Vice President Pence visited Texas on Thursday, stopping in Rockport and Corpus Christi, and touring the affected area by helicopter. He met with Texas Gov. Greg Abbott (R), who declared this Sunday a "day of prayer in the state." Pence also cleared storm debris in Rockport, near where Harvey first slammed ashore.

"We will be here today, we will be here tomorrow, and we will be here every day until this city and this state and this region rebuilds bigger and better than before," Pence said. Of the recovery effort, he said, "It's a long way to go; it's not months, it's years," adding that the challenges are "great."

Also, White House spokeswoman Sarah Huckabee Sanders said that President Trump would donate $1 million of his own money to help with hurricane relief efforts. Sanders said that Trump wants the news media to choose which charity receives the money.

There are early indications that yet another tropical storm may form in the western Gulf of Mexico next week. Although rainfall is impossible to predict in a storm that hasn't developed, any additional rain would be significant for the already devastated region. Not only would it affect and delay recovery efforts, but it also could lead to additional flooding — water on top of water.

"If this system does develop, it could bring additional rainfall to portions of the Texas and Louisiana coasts," the National Hurricane Center said Thursday.

All day Thursday, authorities in Crosby watched the damaged Arkema chemical plant — which manufactures organic peroxides, a family of compounds used in such products as pharmaceuticals and construction materials.

Those chemicals must be kept cold, or they will combust. They are not cold anymore. The storm left the plant submerged in six feet of water, and its cooling systems and backup systems failed.

Now, everyone within a mile and a half of the plant has been ordered to evacuate. On Thursday, there were reports of pops and "intermittent smoke" coming from the compound. It was unclear whether that was the worst of it, or just the start.

An explosion at the plant could release a plume of the chemicals, which have been classified as skin and eye irritants. William B. "Brock" Long, administrator of the Federal Emergency Management Agency, called the potential for a chemical plume "incredibly dangerous" at a briefing Thursday morning.

Already, the Harris County Sheriff's Office said that one deputy was hospitalized after inhaling fumes from the plant, while several others sought medical care as a precaution.

The state's other major crisis was in Beaumont, where the storm hit after Houston, making a detour into the Gulf of Mexico to draw in new strength and water.

Police and the Coast Guard were still rescuing people from the water there, under blue skies. Haley Morrow of the Beaumont Police Department said that about 700 water rescues had been made in the city in recent days.

Then the water went out.

The city lost access to running water after 2 a.m. Thursday, when floodwaters overwhelmed the pumping system through which the city draws water from the Neches River into its treatment facilities.

"When you take water out of the picture, people start to panic a bit," Morrow said.

Morrow said that city officials were scrambling to find a temporary solution to the absence of running water, and to assure residents that help was on the way. They were hoping for a water delivery from the outside, but weren't sure when it would arrive.

At Baptist Hospitals of Southeast Texas on College Street, a parking lot became a helipad on Thursday for a stream of medical helicopters.

Spokeswoman Mary Poole said the hospital was in the process of transferring patients to other local facilities after the city's loss of water.

"That's a game changer for us," she said. "We have medical supplies, we had food, we had staff. But we never dreamed we would lose water supply."

If water is restored, the hospital might not bring the airlifted patients back.

"It's a traumatic experience for a patient to have to be on a helicopter and transferred out," Poole said.

Those without helicopters who were hoping to leave Beaumont found they were on an island, surrounded by murky water. Police said some people who tried to leave anyway were turning around upon discovering that the exit was impossible, driving the wrong way on U.S. Highway 90 to return.

In nearby Port Arthur, an ad hoc volunteer operation was set up to bring people from flooded homes to a new shelter at a bowling alley.

"It's been chaotic, to say the least," said Mason Simmons, a mechanical engineering student at Lamar University, standing with a group of friends and family members on the curb of Max Bowl. They were pitching in to help people off boats and out of pickup trucks.

Simmons said he has seen hundreds of people in the roughly six hours he had been at the bowling alley.

Someone nearby said one boat rescued 60 people.

Inside Max Bowl, some people slept at the edge of bowling lanes. Luggage and plastic bags filled with clothing competed for space with racks of bowling balls.

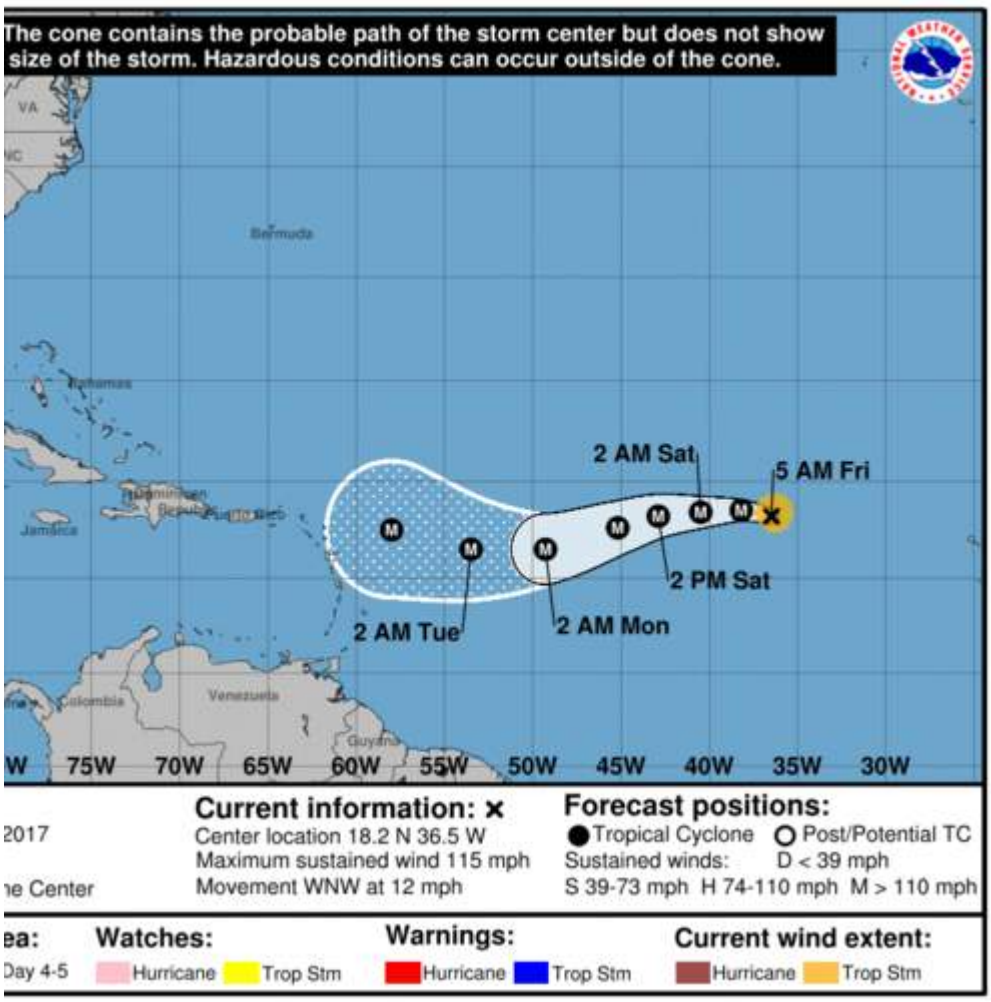
"I think the most incredible part is it's been community organized, really," Simmons said. "There's no one person leading anything. We're just doing what we can."

Hauslohner reported from Beaumont and Fahrenthold reported from Washington. Lee Powell in Port Arthur, Tex.; Jorge Ribas in Beaumont, Tex.: Arelis R. Hernandez and Avi Selk in Houston; Eva Ruth Moravec in Austin; and Mark Berman, Steven Mufson and Angela Fritz in Washington contributed to this report.

Hurricane Irma holding steady as Category 3 storm in Atlantic

Comment

Updated on September 1, 2017 at 6:58 AM
Posted on September 1, 2017 at 6:57 AM



ı is a Category 3 storm moving west in the Atlantic. Here's the ıy tracking map as of Friday morning (Sept. 1). (Image via National ıter)

34
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By **Carlie Kollath Wells**cwells@nola.com,
NOLA.com | The Times-Picayune

Hurricane Irma was holding steady Friday morning (Sept. 1) as a Category 3 storm in the Atlantic, forecasters with the National Hurricane Center said.

It's unclear what impacts Irma might pose to land. Models are notoriously unreliable more than five days away, and Irma is not expected to near the Leeward Islands until sometime

next week. The Leeward Islands are part of the eastern border of the Caribbean Sea.

Hurricane Irma: 5-day tracking map

As of Friday morning, the storm was about 840 miles northwest of the Cabo Verde Islands and about 1,665 miles east of the Leeward Islands. It's moving northwest at 12 mph. It's expected to turn west again Friday night, followed by a turn to the west-southwest on Saturday.

Irma has maximum sustained winds of 115 mph with higher gusts. Fluctuations in strength, up or down, are possible during the next few days, but forecasters say Irma is expected to remain a powerful hurricane through the weekend. Hurricane-force winds extend outward up to 15 miles from the center, and tropical-storm-force winds extend outward up to 90 miles.

Gas prices surge as Hurricane Harvey continues to disrupt refineries, pipelines

by Adam Wilmoth • Published: September 1, 2017 5:00 AM CDT • *Updated: September 1, 2017 5:00 AM CDT*

Bryan Herrera holds a makeshift sign that reads, "Out of Gas", as he stands outside a Shell filling station in north Dallas, Thursday, Aug. 31, 2017. (AP Photo/Tony Gutierrez)

Gasoline prices surged Thursday as the remnants of Hurricane Harvey continued to disrupt refineries and pipeline operations, causing fuel shortages throughout Texas.

No gasoline shortages were reported in Oklahoma, but local fuel prices have climbed as some local gasoline has been diverted across the Red River.

Wholesale gasoline prices jumped almost 26 cents a gallon Thursday while the average retail price in Oklahoma added almost 6 cents a gallon overnight.

"If you're looking out the windows and seeing the refineries — these tools that are supposed to be creating gasoline — are not working, that's why the market has reacted and the price has gone up," GasBuddy analyst Allison Mac said. "There is a reserve, but it takes time to move that around. We're not going to run out of gas. This is not an oil issue, and there are other refineries in this nation, but we are going to suffer some from prices going up."

The country's gasoline stockpiles contained 23.7 days worth of fuel last week before the storm landed, according to the U.S. Energy Information Administration. But that storage is not all in the areas where the fuel is needed now, and infrastructure outages because of Harvey have made it more difficult to move gasoline to where it is needed.

Environmental Protection Agency rules also require different blends for different parts of the country, making it more difficult to move gasoline from one region to another. The EPA on Wednesday waived those rules. The waivers allowed Oklahoma refineries to send fuel to Texas.

"It was a quick effort on EPA's part, and I'm impressed with how quickly that happened," Chad Warmington, president of the Oklahoma Oil and Gas Association, said of the waivers. "It allows us to get gasoline down to Texas. The Alabama and Mississippi oil and gas associations also have called us to coordinate sending supplies."

'The bottleneck isn't with oil'

The bottleneck isn't with oil

U.S. Energy Secretary and former Texas Gov. Rick Perry said Thursday he is releasing 500,000 barrels of oil from the country's Strategic Petroleum Reserve to help alleviate supply disruptions. The largest disruption, however, is with gasoline, not oil. Crude oil production has been reduced in the south Texas Eagle Ford, but is still strong throughout west Texas, Oklahoma and the country's other oil producing regions.

"The bottleneck isn't with oil," GasBuddy's Mac said. "It's a refinery issue. All of this oil needs to be refined. I don't see that (the release from the Strategic Petroleum Reserve) as making a huge impact on prices."

While production has been reduced in the Eagle Ford, damage in the country's second most active oil field appears to be less than feared, Chesapeake Energy Corp. executive Frank Patterson said.

"We were fortunate the Eagle Ford didn't receive as much water as it could have," said Patterson, Chesapeake's executive vice president of exploration and production. "Operationally, we're getting things lined up, but it comes down to the supply chain. Where does that oil and gas go? It all flows back to where the devastation is.

"We also have a lot of our people affected. We want to make sure our people manage their families first, business second."

Corpus Christi refinery operators said Thursday they have begun the process of restarting operations and should be running by early next week. Many Houston-area refineries, however, still are under water.

"Once the water goes down and the refineries go back up, we should see prices drop," Mac said. "We are heading into winter months where demand is slower, and we're switching to less-expensive winter blends. All those factors will drive prices down once refineries are up."

Wholesale gasoline prices, which does not include taxes and other costs applied at the pump jumped 26 cents, or almost 14 percent, Thursday to close at $2.14 a gallon, up 47 cents from before the hurricane struck land last week.

Domestic benchmark West Texas Intermediate crude oil prices gained $1.27, or 2.8 percent, to $47.23 a barrel Thursday, marking its first gain this week.

Adam Wilmoth

Adam Wilmoth returned to The Oklahoman as energy editor in 2012 after working for four years in public relations. He previously spent seven years... read more ›

GRAY MATTERS

Why has Harvey's rain been so extreme?

Russ Schumacher, Colorado State University | August 30, 2017

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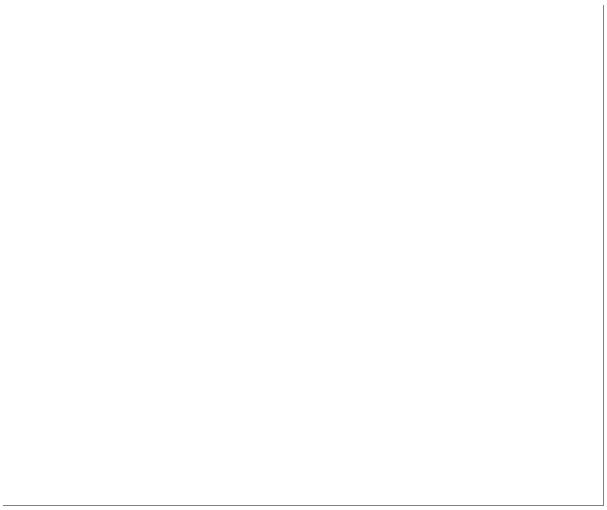
Photo: Karen Warren, Staff Photographer

The floods along Buffalo Bayou on Memorial Drive and Allen Parkway, as heavy rains continued falling from Hurricane Harvey, Monday, Aug. 28, 2017, in Houston.



Fifty inches of rain. Nine trillion gallons of water. The Gulf Coast of Texas, and especially the Houston metropolitan area, has been inundated by rain produced by Hurricane Harvey. And as of this writing, the rain continues along a broad swath of the Gulf Coast, with a flood threat extending all the way east through New Orleans to the Florida Panhandle.

Even for one of the wettest and most flood-prone parts of the United States, the rainfall totals and flooding are breaking records. So, what has made Harvey such a prodigious rain producer?

A 'train' of rainstorms

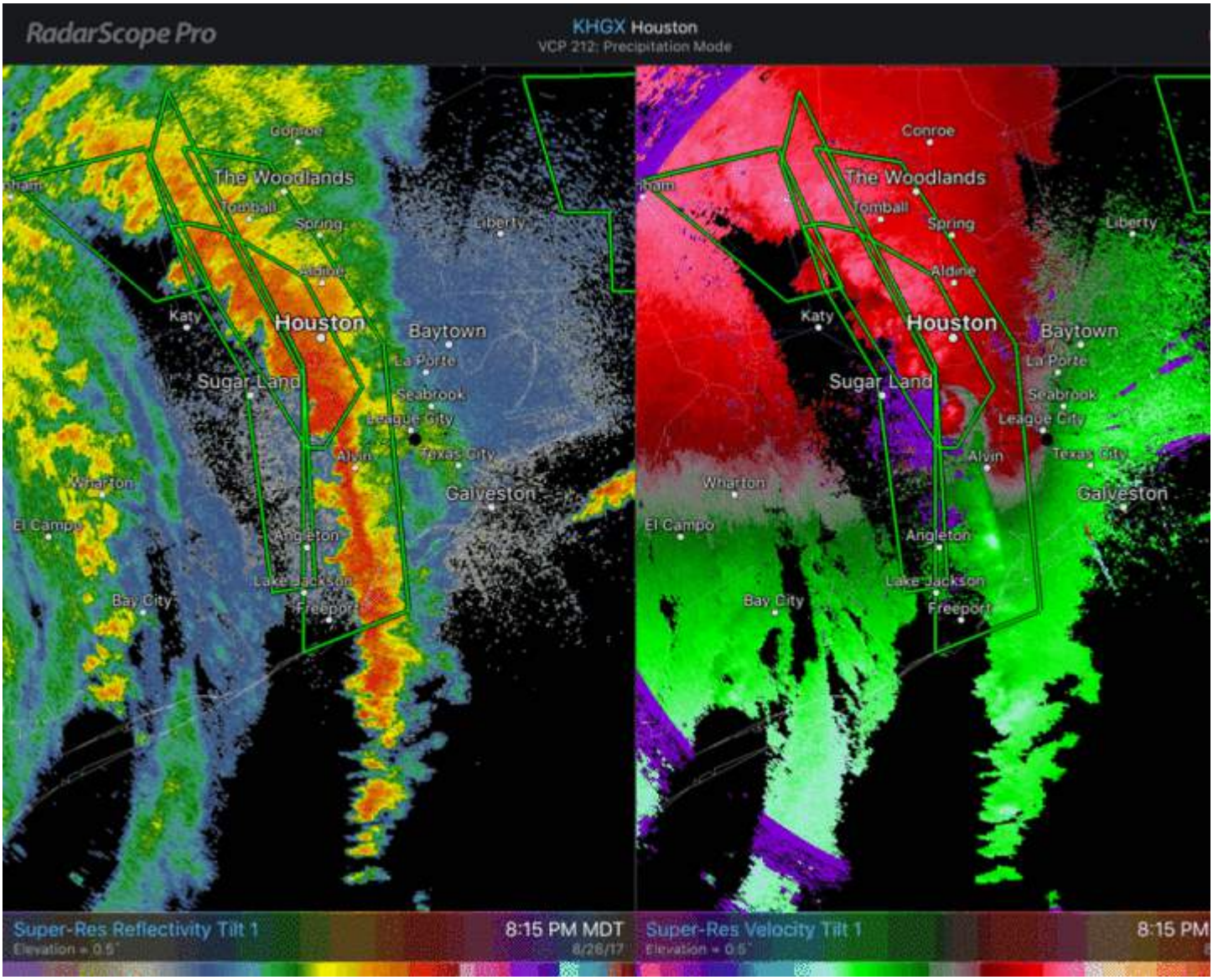
The amount of rain that falls at a given location can be boiled down to a surprisingly simple equation: The total precipitation equals the average rainfall rate, multiplied by the rainfall duration. In other words, the most rain falls where it rains the hardest for the longest.

Tropical cyclones in general are very efficient rain producers, because they draw large quantities of water vapor into the atmosphere from a warm ocean. That moist air rises and the water vapor condenses, and a large fraction of that water falls as rain. Tropical cyclones can also last a long time; if their motion slows, then a particular region can experience that heavy rainfall for multiple days.

Even compared to other tropical cyclones, the rain from Harvey has been very hard, and gone on for a very long time. On Saturday evening (August 26) into Sunday morning (August 27), an intense band of storms developed to the east of Harvey's center, and lined itself up right over Houston. This is a process known as "echo training," in which it appears that the individual thunderstorm cells are like train cars that repeatedly pass over the same spot and bring with them heavy precipitation.

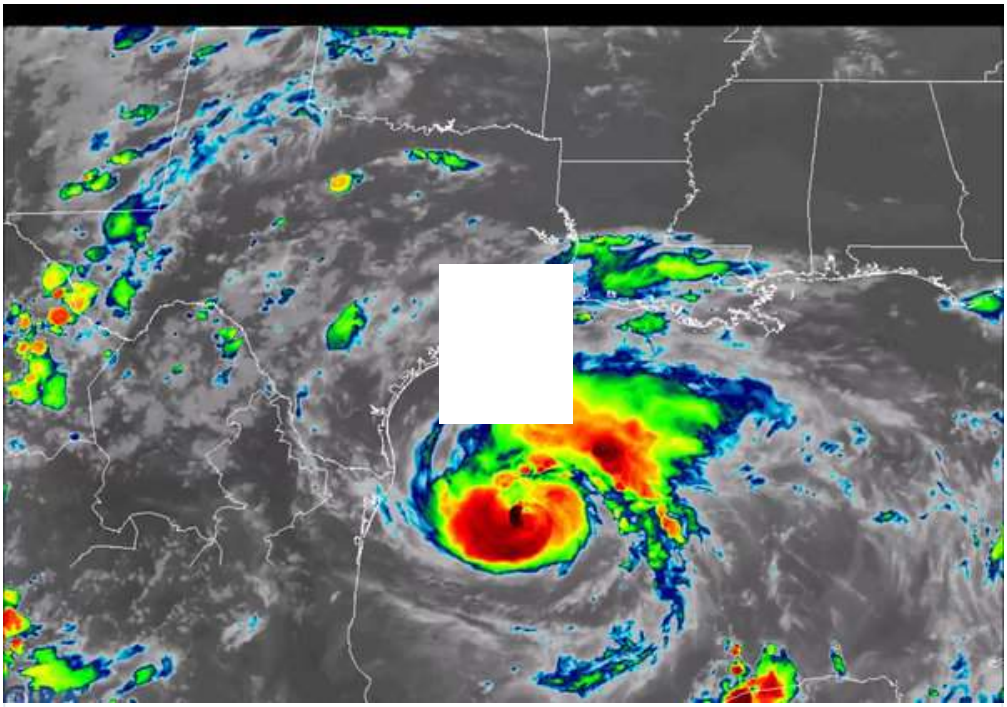
This precipitation band was producing up to six inches of rain per hour – an extremely high rate – and it remained over the Houston metro area for several hours, with a couple more that followed immediately after. One location just southeast of downtown Houston recorded 13.84 inches in just three hours. These rains from Saturday night into Sunday morning initiated the massive flooding in the Houston metro area.

This animation is from the Houston, Texas, National Weather Service radar on Saturday evening, August 26, 2017. The left panel shows radar reflectivity, which is related to rainfall intensity. The right panel shows radial velocity (green colors toward the radar, red colors away). The green polygons show flash flood warnings issued by the NWS, including a rare 'flash flood emergency' for Houston.



Relentless rainfall

Then, after this initial intense burst, there has been no respite. Usually, when a tropical cyclone turns poleward from the tropics toward the United States, it will interact with one or more midlatitude weather systems that will send the storm on its way after a day or two. But this August, the jet stream has been positioned well to the north of Texas, so none of these disturbances has approached, and Harvey's center of circulation has barely moved since it made landfall. As a result, across the Texas (and now Louisiana) coast, there have been periods with intense rainfall (in more of the rainbands described above), along with lighter, but still substantial, accumulations.



NOAA Satellites
@NOAASatellites

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Watch #Harvey's movements over the past 60+ hours with this infrared animation from #GOES16. Latest forecast info @ nhc.noaa.gov

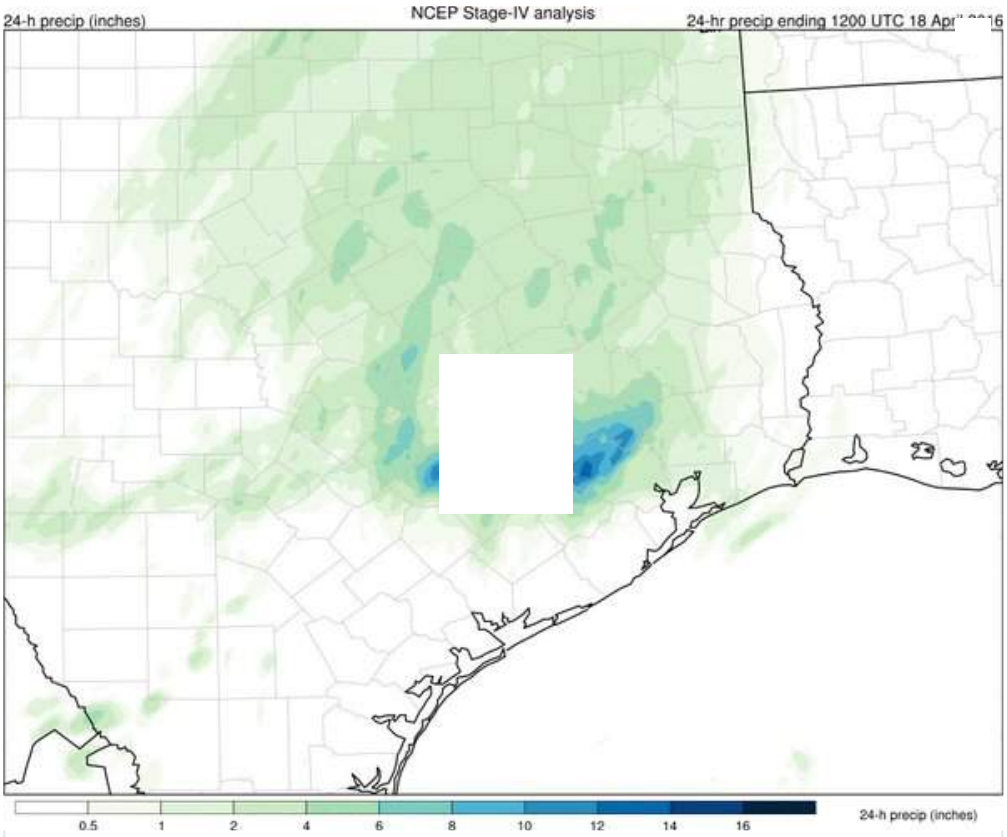
3:15 PM - Aug 28, 2017

11 514 500

This combination of unusually high rain rates and long duration has resulted in a very large area with 30 to 45 inches of rain in a few days.

Those of us who study extreme rainfall and flooding, and those who live in and around Houston, know this area is vulnerable to both very heavy rainfall and destructive and deadly floods. The previous standard-bearer for extreme rainfall in the region was Tropical Storm Allison in June 2001, which produced just over 40" of rain around Houston. But the excessive accumulations were fairly localized. Major floods again occurred on Memorial Day in 2015, and on April 18-19, 2016.

In the April 2016 event, an intense line of overnight storms produced up to 15" of rain in a few hours, similar to the “training” rain bands in Harvey. But with Harvey, the area covered by the heavy rainfall has been vastly larger, and the rain has persisted for days. For comparison, in just one day (ending Sunday morning, August 27, 2017) the area covered by rainfall from Harvey exceeding 16" is several times larger than the entire April 2016 flood event, and at least two more days of similar accumulations have followed.



Russ Schumacher
@russ_schumacher

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Two days of incredible rainfall in nearly the same spot in Texas this spring: April 18 and May 26.

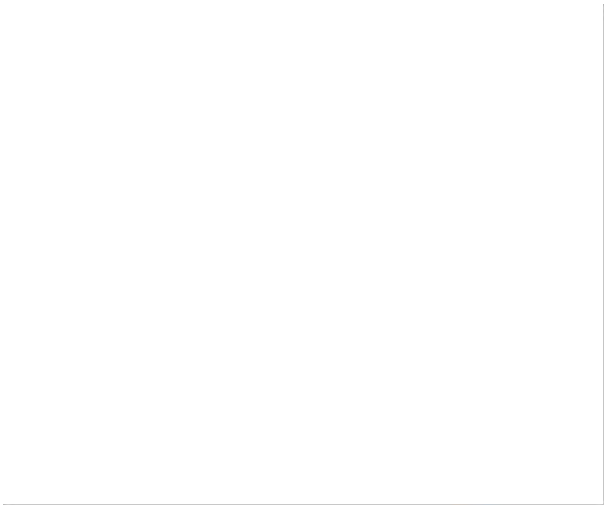
10:59 AM - May 27, 2016

2 41 33

Tornado risks

To make matters even worse, there were also numerous tornadoes reported as the rain bands came on shore. It's fairly common to have tornadoes occur in association with landfalling hurricanes, but what struck me in this case was that tornado warnings were being issued in the same places that had just received massive amounts of rain.

My research group has studied the challenges associated with multi-hazard situations, and specifically when the threats of tornadoes and flash flooding occur in the same place at the same time, as the protective responses to those hazards can be at odds with each other. For people to be under both a tornado and a flash-flood warning at the same time is surprisingly common – these overlapping warnings occur around 400 times per year on average.



But this situation was taken to a new extreme during Harvey, when tornado warnings were being issued at the same time that emergency officials were sending messages for people to go to their roofs for safety (rather than risk getting caught in the attic). The heartbreaking (but also heroic) video footage of water rescues speaks to the immense human impact of this multifaceted storm.

Spot-on forecast

One final remarkable aspect of Hurricane Harvey's rainfall is how accurate numerical weather prediction models – and the human forecasters who use them to make official forecasts – were at

highlighting the incredible precipitation accumulations.

Medium-range forecast models at least a week in advance were showing Harvey stalling out along the Texas coast and producing extreme rainfall. As the event neared, essentially every numerical model was showing accumulations over 25 inches. Often, when meteorologists see models making predictions of events that would be unprecedented, we are rather skeptical of that guidance, because there are no points of reference to compare to. But in this case, the models were in close agreement about the potential for a truly major event, and forecasters saw the gravity of the situation.

Photo: Karen Warren, Houston Chronicle

Members of the Texas Border Patrol bring their boat back to the launch site near Deerbrook Mall, on FM 1960, after currents were too rough to transport an elderly woman needing rescue on Tuesday, Aug. 29, 2017, in Humble.

The NOAA Weather Prediction Center, which makes official rainfall forecasts (and rarely includes extreme amounts), on Friday afternoon (August 25) predicted a broad swath of over 20 inches, with isolated areas up to 40". Never before had the Weather Prediction Center issued a "high risk" of excessive rainfall three days in advance, as usually the uncertainties with forecasting precipitation don't allow enough confidence to do so. In fact, their protocol didn't even allow for such an alert so far in advance! But for Harvey's rainfall, they did this on consecutive days, and with high accuracy, because of the expected extremity of the event. (The

primary errors in the rainfall forecasts in advance of the storm is that they placed the maxima a bit southwest of Houston, instead of centered over Houston.)

One of the fascinating aspects of studying extreme rainfall and flash floods is the wide variety of storm systems that can produce heavy rain, and trying to figure out how the ingredients came together in each of those diverse situations to inform and improve future forecasting. For Hurricane Harvey, researchers and forecasters will be analyzing the ingredients that led to this record-setting flood for many years to come.

Russ Schumacher *is Associate Professor of Atmospheric Science at Colorado State University. This article was originally published on The Conversation. Read the original article.*

Bookmark Gray Matters. It is a very efficient rain producer.

GRAY MATTERS

Twelve steps Houston can take to address our flooding problem

Harvey and the ache of lost family heirlooms

Why has Harvey's rain been so extreme?

She saw the bats drowning. So she dove into action.

EDITORIALS

The disaster in Crosby is purely man-made.

As a chemical plant burns, Texans remain in the dark about toxic threats.

 | August 31, 2017

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Photo: Godofredo A. Vasquez, MBO

The Arkema Inc. chemical plant , flooded from Tropical Storm Harvey Wednesday, is located in Crosby, about 25 miles northeast of Houston. (Godofredo A. Vasquez / Houston Chronicle)

First came the water; then came the fire.

Explosions and flames erupted into the air at a chemical plant in Crosby very early Thursday morning. Floodwaters had knocked out the cooling system needed to prevent organic peroxides from breaking down, and also blocked any path for workers to get back to the site and prevent the disaster.

Now the surrounding residents, living 25 miles northeast of downtown Houston, have been instructed to shut their doors and windows, turn off air conditioners and do everything possible to avoid breathing in the acrid smoke and fumes pouring out of the plant owned by Arkema Inc.

So what, exactly, is in the air?

That's a very good question.

As Chronicle reporters Mark Collette and Matt Dempsey revealed in their 2016 "Chemical Breakdown" series, more than 2,500 facilities throughout the Greater Houston region contain stockpiles of explosive or toxic materials. Federal safety inspections are rare and our state government

helps corporations conceal contents. Politicians, industry leaders and their lobbyists have been working for years to keep Texans ignorant about the chemicals and toxins that dot our landscape.

Rich Rowe, Arkema's CEO, is just another example. He refused to make public the plant's chemical inventory or its federally mandated risk management plan, the Chronicle reported.

Exposure to the Arkema fire has sent 15 sheriff's deputies to the hospital as of this writing, yet the company still won't explain the specific sort of adverse health effects that people should expect from the emissions. The company also couldn't answer pointed question by Dempsey about why volatile materials weren't neutralized before workers fled the site.

EDITORIALS

Hurricane Harvey is a seawall moment for Houston

The disaster in Crosby is purely man-made.

Friday letters: Finding under-utilized housing

Friday letters: Evacuation talk, looking forward, chemical

Harvey highlights how climate is changing

A known carcinogen - polycyclic aromatic hydrocarbons - has already been detected in the smoke, according to Neil Carman, clean air director for the Sierra Club's Lone Star Chapter.

Who knows how bad things really are?

All across Houston's chemical complexes, as Hurricane Harvey bore down, odors and flames settled into the cloud-filled sky. At least 32 air emission events were reported with the Texas Commission for Environmental Quality, and at least 20 chemical or gas leaks have been listed by the Coast Guard's National Response Center.

The National Response Center's log of spills and emissions, Chronicle's business columnist Chris Tomlinson noted, hasn't been updated since Sunday.

In 2013, 15 people died and more than 160 others were left injured after the West Chemical and Fertilizer Company erupted in a massive explosion. Dozens of homes were destroyed but apparently no lessons were learned. A 2016 report conducted by the U.S. Chemical Safety Board found that Texas had failed to respond to the disaster with laws or regulations that would keep Texans safe from a similar sad fate.

How many more people have to end up in the hospital - or the morgue - before our politicians treat chemical threats with a sense of deadly seriousness?

Harvey was an act of God.

The disaster in Crosby is purely man-made.

Gov. Greg Abbott has the ability to call a special session and demand that the Legislature pass laws mandating transparency, safety and land use rules that will prevent future disasters. Until then, we look to Harris County District Attorney Kim Ogg, County Attorney Vince Ryan and federal prosecutors to investigate Arkema and other companies with serious scrutiny.

The lights may finally be coming on at homes across the Gulf Coast, but we still remain in the dark about dangerous chemicals.

EDITORIALS

Hurricane Harvey is a seawall moment for Houston

Harvey should motivate us to take bold steps that will protect us from future disasters.

 | August 31, 2017

2

Photo: Johnny Hanson, Staff

Waves crash into the seawall reaching over the memorial to the hurricane of 1900 as Hurricane Ike began to hit Galveston on Sept. 12, 2008. (Houston Chronicle file photo)

"It would be impossible for any cyclone to create a storm wave which would materially injure the city."

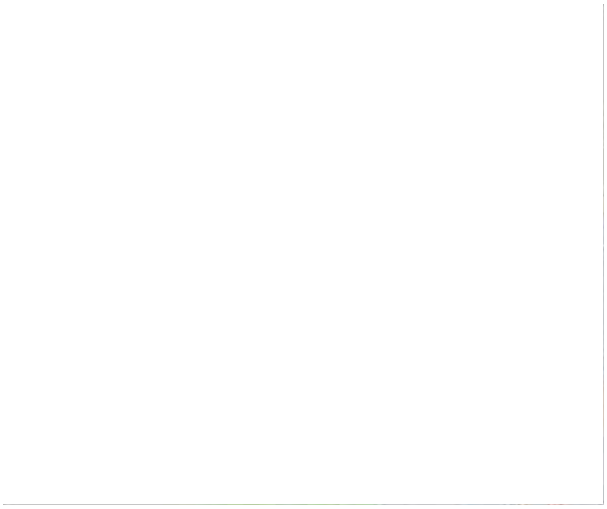
Isaac Cline, the chief meteorologist at Galveston's Weather Bureau, issued that expert - and grievously misinformed - opinion in an influential newspaper article published in 1891. At the time, Galveston was in the midst of a long-running civic debate over whether the city should build a seawall as a defense against hurricanes. Cline's essay dismissed the idea that a tropical disturbance could cause serious damage on the island as "an absurd delusion."

Galveston kept dithering about building a seawall and skeptics kept ridiculing the proposal until the fateful night of Sept. 8, 1900. On that evening, which one survivor described as "a night of horrors," a monstrous hurricane slammed ashore and killed an estimated 8,000 people. Only after that cataclysm did Galveston come to grips with the inevitable: It was time to construct its seawall.

The Great Storm of 1900, a time before hurricanes had names or forecasters had radar, remains the deadliest natural disaster in American history. The storm we have just endured may be the most expensive. Just as survivors of the 1900 storm finally realized they had to stop deliberating about defending Galveston against future hurricanes, we survivors of this storm find ourselves at a historic turning point.

Hurricane Harvey is Houston's seawall moment. This disaster should be the impetus for immediate action addressing flood-related issues we've discussed far too long without governmental action.

We've known for years that, just as a hurricane storm surge killed thousands in 1900, a storm surge today could devastate the Clear Lake area and the Bayport Industrial Complex. The refineries and chemical plants around the Houston Ship Channel provide most of the nation's jet fuel and almost a third of the country's oil refining capacity. We've long discussed how a coastal barrier system could protect this area. Now is the time to build it.



We've also known for years that we've been drawing too much groundwater from the earth beneath us, causing subsidence that aggravates flooding. Over the last century, aquifers here have lost 300 to 400 feet, turning some parts of our area into giant bowls in the ground. Meyerland dropped about 18 inches over the course of 13 years. Nonetheless, at least 30 of the 50 major water suppliers in Harris, Fort Bend and Montgomery counties draw all of their water out of the ground. Now is the time to break our area's dependence on ground water.

We've also known for years that the Addicks and Barker dams are a fracture away from triggering an apocalyptic flood. The Army Corps of Engineers has rated them among the nation's half-dozen most unsafe dams. If they fail, half of Houston will go underwater and thousands could die. Critics also believe the Corps has allowed development to go too far, increasing runoff and impacting the deteriorating dams. Now is the time to stop development affecting the reservoirs and do whatever is necessary to ensure the dams' integrity.

In short, the massive tragedy we've suffered through this week should incite us to undertake bold initiatives. This page has addressed these issues before and we will continue to do so in the

future.

The 1900 storm that killed an estimated 8,000 people taught Galveston a very hard lesson. Another hurricane struck the island in 1915, but city death records indicate fewer than 100 people drowned in that event. The storm surge was blocked by the seawall, the structure civic leaders argued about for decades before a disaster finally forced them into action.

Just as that storm drove Galveston to build its seawall, Hurricane Harvey should be the catalyst motivating us to finally act upon difficult and expensive flood protection measures. Let's stop talking and get to work.

GRAY MATTERS

Twelve steps Houston can take to address our flooding problem

Jim Blackburn, for the Houston Chronicle | August 31, 2017

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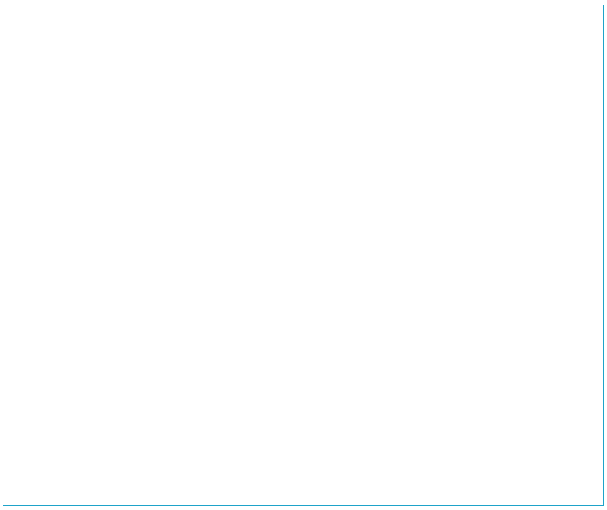
Photo: Brett Coomer, Staff

A boat runs past houses flooded by Harvey on Tuesday in Spring.



The Houston region has a major flooding problem. Denying this fact does a disservice to us all, because flooding will only get worse in the future as the intensity and frequency of severe rain events increases.

If we do not admit that we have a problem, we will never focus the resources and the effort that this problem demands. We must get past the belief that telling the truth about it will be bad for the community and an indication of governmental failure. Nothing could be further from the truth.

Engineering alone will not solve the problem. We have some of the best engineers in the country in this community, yet large storm events do and will overwhelm our systems periodically. We need to use all the tools at our disposal to address flooding, and we have many tools. We need to be creative. We need to be firm. We need to roll up our sleeves, say "enough is enough" and address these problems.

In the paragraphs below, a series of ideas are presented that should be seriously considered to address our flooding problem. Taken together, these actions would help us live safer and more secure lives and create a more resilient economy.

1) First, we cannot control flooding, but we can manage flooding and the damages and disruption to our lives. Our land is flat. Our bayous have limited capacity. Our existing, legacy flooding problems are substantial. And our severe rainfall events are becoming more frequent. We need to

be honest about our flooding situation. Citizens should be given the courtesy of accurate and up-to-date information and answers to the questions that all of us have. The primary clients of our governmental entities should be residents. In our zeal to support new development, we often forget those who are already here. That has to stop.

2) We must get a handle on the projected rainfall from big storms such as Harvey as well as the simpler frontal movements such as those that generated the Tax Day and Memorial Day floods. Our current concepts of the 100-year and 500-year floods and flood plains are obsolete. We have to stop denying that our climate is changing. We have had too many big storms over the last few years to simply write them off as aberrant. They are part of a new pattern of severe storm events that will plague us for decades to come, according to climate change experts. We need to understand what we are dealing with and start giving our citizens first-class information about these issues. State and local government employees are afraid even to mention climate change because of the politics – because of fear of losing their jobs. Well, the politics need to be damned if they refuse to recognize a key element of protecting our citizens from current and future flood problems.

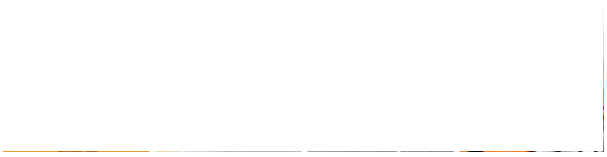
Photo: Michael Ciaglo, Staff

More than 240 billion gallons of water rained down on Harris County during the Tax Day Flood in 2016.

3) Addicks and Barker reservoirs are the best flood control investment ever made in the Houston region, combining large land areas and high levees to impound water upstream of the heart of the city. But these dams are currently in bad shape and are rated as two of the six most dangerous dams in the United States due to structural issues that are compounded by the large population protected by them. The protection and restoration of these dams is a major priority that must be taken forward. Even more important is the fact that over the 60 or more years that they have been protecting us, they have slowly been filling with dirt and sediment from stored storm water. The capacity of these reservoirs could be increased substantially by removing this accumulation, and we should do it. There is at least one new reservoir that should be constructed in northwest Harris County that can help on flooding along Cypress Creek, Bear Creek and Buffalo Bayou. It should be pursued as soon as possible, and other upstream locations should be found on virtually every stream in our region.

4) We need better information about flooding and floodplains – what they are, how dependable the maps are and how to live near our bayous and creeks. Many of us have lived through several 100-year and a few 500-year storms, now. We need better information about what our rainfall future holds for us, and we need to be honest about it. The floodplain maps for the county should be redrawn with new and realistic rainfall amounts. The appropriate rainfalls are larger than what is currently mapped. It is difficult to know how large these rains should be, and it must be carefully, and honestly, studied. There will be development and redevelopment implications to new maps just as there are consequences of bad maps. We should encourage pier-and-beam construction in all areas of our region and not accept filling in flood plains that interferes with flows.

5) Buyouts are occurring sporadically, but there has never been public discussion or full disclosure of our policy for pursuing buyouts. There might be some areas that are too deep in the floodplain to save. We need to be honest and talk about these things. There should be an easily available map of areas where buyouts have occurred and are likely to occur in the future. We should have public meetings or some form of public participation to discuss the extent to which we wish buyouts to be a part of the overall flood protection approach in Houston and how fair values can be ensured to the homeowners in these danger zones.



6) Special policies and information regarding hurricane-generated surge flooding is essential. If and until some type of structures are built, our developments bordering Galveston Bay and the Gulf of Mexico are extremely vulnerable. No flood-risk area is more dangerous to our economy and our environment than our surge zone. There is a real chance that hundreds, if not thousands, of people could be killed during a severe surge event on Galveston Bay, yet new home buyers there receive virtually no information about surge flooding when they purchase a home. Many areas of concern from a surge flooding standpoint are not in mapped 100-year floodplain. Information about our hurricane risks is essential in a community that does not generally support strong governmental regulation. We need to help each other stay out of harm's way. If we make a decision to buy in a high-risk flood area, it should, at the least, be with full information and full disclosure of risk.

Photo: Brett Coomer, Staff

Water is released from the Addicks Reservoir after Harvey.

7) There has been a lot of discussion about extremely large and very expensive projects such as the Ike Dike along the coast. However, there are measures that could and should be taken now to begin building certain pieces of a comprehensive system that will be essential today as well as tomorrow. Some have suggested that we simply wait until the "big one" comes so that we can then receive federal "guilt money" for the solution. If the "big one" comes, Galveston Bay will be destroyed for decades with oil and hazardous pollution. Our economic base will be destroyed. There are workable solutions that are much cheaper than the Ike Dike. We have too many flooding problems in our region to invest $15 billion in a single project. We have problems that span upstream and downstream. They are all serious, and they all demand attention. But there is only so much money.

8) Speaking of money, we have to start raising more money for local flood damage reduction. We need federal help, but we also need state and local money. The Dutch have a national flood assessment that goes into their comprehensive, multifaceted approach to protect their country from flooding. Our flooding problems in the Houston-Galveston region are no less staggering than were the problems in the Netherlands. Like the Dutch, we need to be willing to tax

ourselves to raise the needed money. We have a solid industrial base. We have a generally wealthy and vibrant community. We can do this, but not without proper funding.

9) We need a comprehensive flood-information system. With today's technology, we should be able to obtain up-to-date information about rainfall intensities, bayou conditions and flooded roads and intersections. No one should die driving into a submerged intersection that is known to have problems. We need the best flood-warning and flood-information system in the U.S., one that matches the extent of our flooding problem, which is among the worst in the U.S., according to payouts on flood insurance (and that was before Harvey). We should be able to find out about all development permits being issued in all watersheds and how the runoff generated by that development, new or rebuilt, was handled.

10) Our pattern of development has been outward from the center of the city up the watersheds of the various bayous and creeks. As such, our new upstream development has dumped increased runoff on our older downstream subdivisions and commercial structures. Inadvertently, we have flooded older neighborhoods while attempting to keep flood-control costs lower in the new ones, effectively subsidizing new development on the backs of the downstream residents. Floodplain maps have grown, and more people are in the 100-year floodplain than in the past. We must ensure policies exist that require no more runoff from new development than was the case before development.

Photo: Mark Mulligan, Staff Photographer

The streets of Meyerland, an older neighborhood near Brays Bayou.

11) There is still undeveloped land in the western portions of many of our watersheds, and these undeveloped areas contain wetlands and have the capacity to hold large amounts of stormwater, with that amount potentially increased with the selective use of levees. Purchasing and setting aside these undeveloped areas must be part of the long-term protection of the region. Currently, we are buying out flooded subdivisions at a cost of somewhere around $500,000 to $1,000,000 per acre. Even higher-dollar land on the west side of the city can be bought for 10 times less than the cost of buying out homes after we flood them. We need to get smart. Recent data suggest that a restored prairie can receive and store much larger amounts of rainfall than previously thought. We don't need to re-engineer what nature has given us. We need to finds ways to keep it natural and pay the landowners a fair price for the "service" that their lands either are doing or could do for our region.

12) We need to develop metrics to keep up with the success or failures of our alternatives and expenditures. We need to keep a tally sheet by watershed of the number of acres in

the floodplain and floodway (and report changes such as occurred between 2004 and 2007), the number and location of homes flooded, the worst-flooded streets and intersections, the number of cars flooded, the amount of damages per watershed, the amount of money spent on flood damage reduction per watershed, the number of grandfathered permits and variances issued, etc. We need public accountability and transparency in our flood control. Every major corporation in the United States has excellent metrics of virtually all aspects of their business, often displayed on their web site for all to view. We need something like this going forward.

These ideas are a starting point for discussion and action to improve our situation relative to flooding. It is time to pull out every option that we have and figure out how to use them collectively. It is not all or nothing. It is a mixture of strategies both structural and non-structural that will lead us to find better ways to live with the large rains and flat land where we have built the Houston-Galveston region.

Jim Blackburn *is an environmental lawyer and co-director of the SSPEED Center at Rice University.*

button below.

GRAY MATTERS

Twelve steps Houston can take to address our flooding problem

Harvey and the ache of lost family heirlooms

Why has Harvey's rain been so extreme?

She saw the bats drowning. So she dove into action.

Houston laughs at most floods. Not this one. Not yet.

Official Publication of:

Grand Resilience: How a State Agency Pioneered Gas Technology and Bolstered Critical Supply

09/01/2017 | Sonal Patel

(http://www.powermag.com/wp-content/uploads/2017/09/splash_fullplant_grec3_web.jpg)

Unit 3 at the Grand River Energy Center in Chouteau, Oklahoma, was the Grand River Dam Authority's first construction project in 30 years. Yet, the team put this distinct project—one of the largest and most efficient in the U.S.—online as planned, despite natural and technical challenges. For that and other reasons, it is a worthy 2017 Top Plant award winner.

The Grand River Dam Authority (GRDA), a non-appropriated agency founded by the Oklahoma Legislature in 1935, has sought in recent years to diversify its power generating portfolio to ensure it can continue to reliably supply power to some portion of 75 of the state's 77 counties—including its direct customers, which include municipalities, a host of electric cooperatives, and 80 industrial and commercial customers that are primarily clustered in northeast Oklahoma.

Earlier this decade, as a bevy of coal generators reassessed the economic viability of their assets in the face of new, stricter federal environmental rules governing coal plant emissions, GRDA opted to discontinue use of coal at Unit 1 at its Grand River Energy Center (GREC)—a 1,010-MW dual-unit coal-fired facility located in Chouteau, Oklahoma—rather than install substantial upgrades needed to meet the Environmental Protection Agency's (EPA's) Mercury and Air Toxics Standards (MATS). In part to support that decision, GRDA's board of directors in 2013 approved a strategic plan to achieve a more balanced portfolio. "A key objective was to rely less on coal, and to maximize use of abundant wind and hydro generation," the agency told *POWER* in August. "However, wind and hydro are intermittent and maintaining reliability 24/7 is challenging."

After considering its options, GRDA determined that adding a new advanced-class combined cycle unit would offer customers the best long-term value when integrated into its existing portfolio. However, the project came with a challenging condition: Because the MATS rule required the 1978-built 490-MW GREC Unit 1 to discontinue coal use by April 2017, the new gas-fired Unit 3 would need to come online before the 2017 summer peak period to avoid crippling power shortages.

POWER POINTS

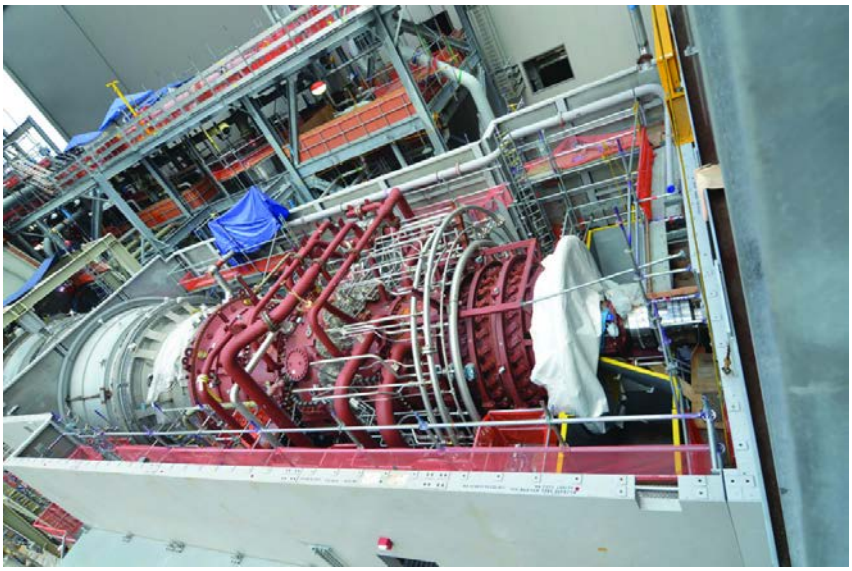
Winning Attributes

- Project team overcame weather-related difficulties, and the logistics challenges presented by a concurrent retrofit to a co-located unit's air quality control system.
- Highly efficient combined cycle plant replaced an aging coal-fired unit that would have needed pollution control upgrades.
- Successful integration of the first J-series unit built and installed in the U.S. with a custom-designed heat recovery steam generator.

(http://www.powermag.com/two-sce-gas-battery-hybrid-projects-revolutionize-peaker-performance/grda-power-points/)

A High-Efficiency Determination

Swiftly kicking off the process, GRDA immediately contracted Black & Veatch to provide its technical expertise as owner's engineer. After evaluating competitive proposals from an assortment of highly qualified bidders, the agency in January 2014 chose to equip the plant with a state-of-the-art 495-MW Mitsubishi Hitachi Power Systems (MHPS) M501J gas turbine (Figure 1)—a technology never before installed in North America, but which is renowned for its high-firing temperatures (inlet temperatures hover at about 1,600C or 2,912F) and its large capacity.



(http://www.powermag.com/wp-content/uploads/2017/09/figure-1_grec3_mhpsturbine.jpg)

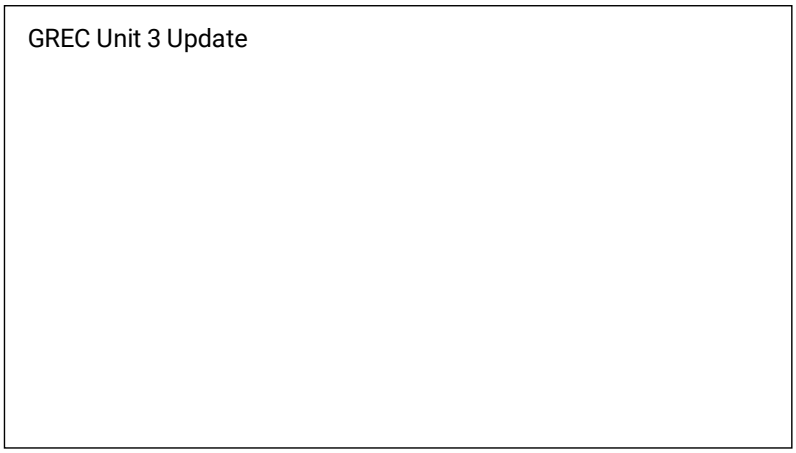
1. First of its kind. The M501J gas turbine installed at the Grand River Energy Center is the first J-Series to be built at the Savannah Machinery Works in Savannah, Ga. It is paired in combined cycle with a steam turbine, also supplied by Mitsubishi Hitachi Power Systems (MHPS). As part of the project, Grand River Dam Authority signed a long-term service agreement with MHPS. *Courtesy: GRDA*

At the time, MHPS had installed nine M501J 60-Hz turbines around the world, accumulating more than 28,000 hours of operation. MHPS's key selling point was the machine's efficiency. "At baseload, the M501J will provide over 61% combined cycle efficiency. In addition, at 50% output, you're still above 55% combined cycle efficiency," an executive from Mitsubishi Hitachi Power Systems Americas said in a press release describing the contract signing with GRDA on March 21, 2014.

For GRDA, the decision was rooted in the technology's "superior efficiency," but also "proven reliability, initial cost, and overall long term value to GRDA customers." Financial viability was a key consideration, it said. "The new combined cycle unit would need to have lowest operating cost for a combined cycle unit in the Southwest Power Pool. Therefore, a very strong design effort was made to maximize sustained efficiency and capability. This included the use of [an] inlet air chilling system and built-in redundancy appropriate for a long-term utility grade unit."

To maximize efficiency and reliability, GRDA chose to couple the J-series gas turbine with a heat recovery steam generator (HRSG) that was custom-designed by Nooter/Eriksen. The triple-pressure, reheat-designed HRSG includes duct-firing along with advanced emission control technology. The St. Louis–headquartered company "worked very closely with design engineers to integrate the HRSG into the overall design," GRDA said.

By December 2014, GRDA had finalized the key engineering, procurement, and construction (EPC) contract with Kiewit subsidiary The Industrial Company (TIC). The agency broke ground on the project on January 23, 2015, marking the first time in more than three decades that GRDA had begun construction on a new power project.



Video: The Grand River Dam Authority's newly constructed Unit 3 at the Grand River Energy Center achieves sellable power. Courtesy: GRDA

Overcoming Multiple, Serious Hurdles

Project developers had anticipated some technical challenges associated with integration of the first-of-its-kind combustion turbine and the HRSG. "These challenges were overcome by assignment and commitment of the best 'A team' experts from each project partner," GRDA explained. The challenges it couldn't anticipate, however, involved a double whammy by "Mother Earth."

When crews began building Unit 3 and an associated substation, GRDA was simultaneously executing a project to upgrade air quality control systems at the 1986-built coal-fired Unit 2, which involved replacing the existing electrostatic precipitator with a fabric filter and adding an activated carbon injection system. "This challenge was resolved by first developing a general site construction plan identifying milestone construction events, blackout areas, delivery and storage areas, parking, site security, and other key features necessary for coordinating these three projects," the agency said.

All proceeded as planned until July 2016, when Unit 2 suffered a severe lightning strike that caused catastrophic fire damage to its turbine generator. The event forced GRDA to take the critical 520-MW unit offline, heightening the agency's worries about how to provide regional reliability when Unit 1 would be unavailable due to the MATS in April 2017. "Restoration required 13 months of heroic efforts by GRDA, Siemens, and General Electric," GRDA said.

Around the same time—and adding to its tense situation—prolonged rainfall in southern Louisiana resulted in unprecedented flooding, a declared state of emergency that delayed delivery of major components to the Unit 3 project and threatened to derail it. GRDA, which only six months earlier had faced a similar deluge of rainfall that had pushed lake levels at Grand Lake and Lake Hudson to historic levels and forced it to manage some of the largest floodwater releases since construction of its Pensacola Dam in 1940, watched the situation with some dismay.

When the components finally arrived months later, teams regrouped and formed a detailed critical path plans to compensate for the delays. That planning paid off, and though "night work was done when required," the plant was synchronized to the grid by March 2017.

An Emergency Order

Still, fearing more unseen debacles, and citing a possible imminent shortage of generation resources in its service area, GRDA urged the U.S. Department of Energy (DOE) to issue an emergency order allowing it to combust coal at Unit 1 as required by the Southwest Power Pool between April 16, 2017, and July 15, 2017, when Unit 3 was expected to be operational. The DOE granted the request under the Federal Power Act (http://www.powermag.com/doe-issues-first-ever-emergency-order-to-keep-open-a-unit-that-is-noncompliant-with-mats/)—only the seventh time it has done so—to secure power reliability, triggering the so-called "reliability valve" that had been widely discussed since the EPA's MATS rule was still in the draft stage. Although kept available, Unit 1 was "utilized very little during this period," GRDA said.

Meanwhile, under pressure to stay on schedule, crews at GREC kept working to finish the project. Sellable power status was achieved just two months later on April 27, 2017, less than 45 days after first fire. That milestone was followed by extensive performance testing, and the new unit is now being dispatched into the Southwest Power Pool.

According to GRDA, efficiency goals are being met. “Thermal efficiency exceeding 60% has been demonstrated during summertime generation,” it said. Charles Barney, an engineer who serves as GRDA’s assistant general manager for fuel and generation projects, added: “We’re excited that Unit 3 responds quickly to load changes while maintaining high efficiency.”

Safety and Cooperation Is Paramount

When asked about the project’s most-winning aspect, GRDA pointed to its stellar project team. “At the onset of the project, a team mission statement was developed that included objectives to achieve a new standard for efficiency—and that no one would get hurt,” the agency said. TIC/Kiewit led regular project teambuilding sessions to keep the project on track. More significantly, it noted: “Construction team members achieved an incredible safety record of over 1.2 million man-hours worked without a serious injury.”

GRDA also credited MHPS for “first class” support during construction and commissioning, and Nooter/Eriksen for its close collaboration. Hitachi HVB, it added, provided the transformers that have performed flawlessly and were delivered ahead of schedule, and Enable Midstream Partners “provided a new gas pipeline to fuel the new unit, ahead of schedule and under budget.” For Jammie Burrow, chief engineer at GREC, the achievement cannot be underscored enough: “We had a schedule to meet that some said couldn’t be done, but we needed to have this unit running for summer of 2017. We’ve achieved that!” ■

—Sonal Patel is a POWER associate editor.